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The effects of employment on high school performance

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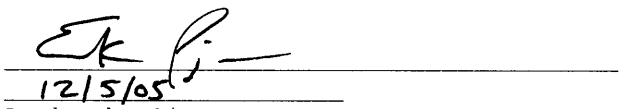
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The effects of employment on high school performance

(TITLE)

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Erik Pizer

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The Effects of Employment on High School Performance

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Table of Contents

Abstract

Previous research on the effect of employment on high school performance has produced inconsistent results. This study investigates the influence of work hours on academic achievement, measured by grade point average (GPA). GPA is chosen because it is a more direct measure of performance in high school than standardized tests. It captures the day-to-day performance of students on everything from homework to quizzes and in-class participation to final examinations.

GPA falls by 0.02 grade points for every ten hours worked. This decrease in academic achievement caused by work may result from the displacement of extracurricular and co-curricular activities by work and work-related commitments. Standardized-test scores, socio-economics status, time spent doing homework, and time spent on extracurricular activities are also found to be positively related to GPA.

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List of Tables

Introduction

At the beginning of the 20th century, very few teenagers were enrolled in school. Instead, teenagers were occupied mostly with keeping up the family farm or working elsewhere for pay. Now in the 21st century, completing high school is more than commonplace; 16-, 17-, and 18-year-olds are primarily occupied with obtaining a diploma. This is not to say that teenagers are no longer seeking employment. The trend over the past century was not toward school instead of employment, but rather towards education along with paid employment (Warren, 2002). Part-time work during high school has indeed become a common occurrence among students in the United States. Students in the 1990s were twice as likely to be employed compared to students in the 1950s (Singh, 1998). In 1997, 92% of males ages 22-27 reported having some work experience while attending high school (Hotz, Xu, Tienda, & Ahituv, 2002). An interesting note is that part-time employment during the school year is a distinctly American phenomenon; it does not occur as extensively elsewhere in the developed world (Greenberger & Steinberg, 1986; Lillydahl, 1990; Tyler, 2003). According to Greenberger and Steinberg (1986), "the proportion of the youth cohort who work, the extent of their commitment to jobs, and the social origins of youngsters who work are not duplicated elsewhere in the world today."

In the United States, high school is an important time in a teenager's life. It is a time when one finds his or her own identity and desire for independence. Many new responsibilities come with this fresh taste of freedom. This is also the time that many parents start to push teens to "grow up" and become an adult. A major step for a teen to take towards becoming an adult is getting his or her first job. However, having a job can

create problems for the teen because it can take time and focus away from schoolwork. Does the presence of a part-time job interfere with schoolwork, or does the problem only arise after the number of hours worked reaches some threshold? These are relevant questions given recent trends, especially because previous research on the effect of employment during high school has produced inconsistent results. Many researchers estimate the effect of working (being employed vs. not being employed) on academic achievement, but few consider the effect of the number of hours of employment. To bridge this gap, this study examines the influence of work hours on academic achievement.

Literature Review

Part-time employment is most common among white, middle-class high school students coming from two-parent households (Lillydahl, 1990; Johnson & Lino, 2000). Johnson and Lino (2000) also find that having one or both parents that work increases the likelihood of a teen being employed. Thus, the choice of teens to seek employment does not seem to be motivated by serious economic need. The U.S. Department of Agriculture estimates of family expenditures on children indicate that middle-income families spend an average of $9,450 per year on the typical teenager (Johnson & Lino, 2000). However, teenagers from the lowest-income families are the least likely to obtain employment, and fewer than one in ten contribute a large portion of their paycheck to assist in the family's finances (Greenberger & Steinberg, 1986). That is not to say that teens in low-income households do not contribute at all to family income. In low-income families, the earnings of the working teen account for 9 percent of household income (Johnson & Lino, 2000). This moderate share of household income appears to go mostly to the teen's own expenses, such as clothing (Johnson & Lino, 2000). An increase in jobs suitable to teens, a greater emphasis on consumerism and commercialism, and an increased desire to enjoy the associated benefits of money earned from working are further evidence that teens work for reasons other than economic necessity (Greenberger & Steinberg, 1986).

Perhaps one of these other reasons has to do with racial background. For example, recent figures point out that racial differentials in employment have continued into the present decade, improved economic conditions notwithstanding (Gardecki, 2001). Historically, white workers have held jobs at higher rates than black workers and, for young workers, this gap widened in the 1960s and 1970s when the employment rates of

black workers decreased further (Gardecki, 2001). Before racial discrimination can be held accountable for these differences, the probability of teens' labor force participation must be studied. The employment probability relevant for the analysis of employer discrimination is a conditional probability because it depends exclusively on the worker's prior presence in the labor force (Mohanty, 2002). This probability separates those students who choose not to seek employment from those who are looking but do not get hired, making it possible to determine if discrimination occurs.

It must be remembered that teen employment is not only a black and white issue. Mohanty (2002) finds, in Los Angeles County, that while the participation probabilities of white and Latino students are higher than those of black students, these probabilities are lowest for Asian students. This could be credited to cultural differences between Asian immigrants and the rest of the U.S. population. To further this thought, Mohanty (2002) suggests that "most recently immigrated Asian parents do prefer their teenage children to focus exclusively on school and not enter the labor market." This generalization supports the idea that there are many reasons for racial differences in teen employment.

A student's racial background is not the only factor determining probability of employment; other characteristics of the teen's family may also affect his or her probability of working. These factors may indicate unobserved family characteristics that promote labor market participation (Gardecki, 2001). Common factors include the employment behavior of the teen's parents and siblings, whether or not it is a single parent household, and the poverty status of the household (Gardecki, 2001).

Ruhm (1997) discusses how high school employment affects future economic attainment. The findings of his estimation conclude that light to moderate job commitments of 10 to 15 hours per week do not have a detrimental effect on future attainment (Ruhm, 1997). In fact, he finds that hours worked during the senior year of high school are positively correlated with future earnings and occupational status (Ruhm, 1997). For example, six to nine years after high school, seniors employed 20 hours per week are expected to earn approximately 22 percent more annually and to obtain 11 percent greater hourly compensation than their counterparts who do not work (Ruhm, 1997).

The promise of these future outcomes may also affect a teen's decision to work. This positive effect is worth noting because employed seniors continue on to achieve slightly less education throughout their lives than non-employed students, even though holding a job during senior year is positively associated with high school graduation rates (Ruhm, 1997).

As previously discussed, part-time work during the teenage years is nothing new to the United States. What is new is the work intensity reported by U.S. students. Not only do large numbers of high school students work in this country, but many also tend to work long hours during the school week (Tyler, 2003). For example, twelfth graders who reported working in 1991 worked an average of 28 hours per week (Tyler, 2003).

The increasing rates of high school employment are catching the nation's attention. Public concern about the amount of time students spend at a job has led some states to consider laws that would limit the amount of time students can work during the school year (Tyler, 2003). This public awareness fails to take into account that the effects

of high school students working part-time can be either positive or negative. For example, in 2003 University of Minnesota researchers found that high school students who work 20 hours a week or less reap several benefits including increased confidence, improved time-management skills and enhanced academic success (Jayson, 2005). These students who worked 20 hours per week or less also earned the highest grades, outperforming even students who never worked (Oettinger, 1999). On the other hand, the work intensity of U.S. students may instead adversely affect their academic performance. Because the number of hours worked does seem to have a significant effect on academic achievement, it may explain why American students score lower than students in other countries on several measures of academic achievement (Tyler, 2003).

The theoretical perspective about the effect of part-time work on academic achievement that is dominant throughout the literature is the zero-sum model (Singh, 1998; Marsh, 1991; Warren, 2002). This approach posits that time is limited, and when time is spent working, it takes the place of academic activities such as homework (Singh, 1998). Consequently, work reduces time involved in school which results in poor academic performance. However, the literature provides arguments that the opposite may be true (Lillydahl, 1990). Employment and academics may, in fact, be complementary in some cases. Some employers may reinforce the same traits or values that teachers provide which may, in turn, promote desired behavior in students leading to academic success (Lillydahl, 1990).

However, there is a problem with the zero-sum model. This model assumes that time and energy spent working reduce time and energy that would otherwise be spent only on school related activities (Warren, 2002). It seems much more likely that there are

other activities in a teenager's life, and it is possible that time and energy devoted to work may lessen time and energy spent on socializing with friends, watching television, and other leisure producing activities (Warren, 2002). In fact, Schoenhals, Tienda, and Schneider (1998) conclude that time spent watching television decreased as hours worked increased. On the other hand, although employment might reduce time allocated to study by directly reducing the time available for studying, if income and time both significantly add in producing leisure, employed students may substitute leisure for study during their non-work hours (Oettinger, 1999). Problems aside, the zero-sum model is both intuitively appealing and quite sensible. Its simplicity in use is demonstrated by the number of researchers who adopt, either explicitly or implicitly, a zero-sum model. Almost universally, analysts use this one particular conceptual model when exploring the association between high school employment intensity and academic achievement (Warren, 2002).

Throughout the literature there are many different methods used to estimate the effects of high school employment. The differences vary in terms of the choice of dependent and explanatory variables to the type of estimation procedures used. The actual goals of past studies have also varied. The effect of child labor laws across the states on the number of hours worked is estimated by Tyler (2003) using two stage least squares (2SLS). Oettinger (2000) also uses 2SLS, this time studying the seasonal and sectoral patterns of the youth population. A multiequation model, which included a tobit equation representing the decision to work or not and how many hours to work and a probit equation estimating a student's plans for college, was estimated using 2SLS by Lillydahl (1990). Although instrumental variable estimations are used in a number of

papers (Lillydahl, 1990; Ruhm, 1997; Oettinger, 1999; Oettinger, 2000; Tyler, 2003), finding suitable instruments that are uncorrelated with the error term but significantly correlated with high school employment has been difficult in practice (Oettinger, 1999).

Many of the studies use standardized test scores as the measure of academic achievement (Lillydahl, 1990; Singh, 1998; Tyler, 2003). This seems to be an inaccurate measure of the outcome. It seems unlikely that employment will affect standardized test scores significantly simply because these tests measure the students' given knowledge of a subject at a given time. A better measure then is grade point average (GPA), because in the zero-sum model, time spent working directly affects time spent on homework and studying. These are the direct components of a high school student's grades. Grades are also the method used by teachers to evaluate students. This seems to be the most relevant measure of academic achievement since GPA may influence the decision to go to college, which then affects future economic status. In support of this assertion, Lillydahl (1990) finds that working has a slightly negative effect on GPA, but no significant effect on SAT scores. Many researchers also estimate the effects of being employed or not being employed on academic achievement, but few consider the effect of the number of hours of employment (Lillydahl, 1990). In keeping with the zero-sum model, GPA seems a more appropriate variable.

A drawback in the literature is that very little research has been done using more recent datasets. As stated previously, the percentage of high school students that are working has greatly increased over the past two or three decades. Most studies use data from longitudinal surveys done more than twenty years ago. For example, the National Longitudinal Survey of Youth (NLSY) is used by many other studies including Hotz et

al. (2002), Oettinger (1999 and 2000), and Ruhm (1997). The sample members consist of 12,686 individuals who were between the ages of 14 and 21 on January 1, 1979 (Oettinger, 1999). Another outdated and yet often used source is the High School and Beyond (HSB) data on students who were twelfth graders in 1982 (Tyler, 2003). A more recent set of data is the National Educational Longitudinal Survey of 1988 (NELS88). The participants of NELS88 were twelfth graders in 1992, a full decade later than the students used in most other studies. Tyler (2003) and Singh (1998) make use of the NELS88 data in their analyses. To better understand what is happening with high school students today, it seems important to use these more recent data sets.

Data and Summary Statistics

The data used in this study come from the second follow-up survey of the National Educational Longitudinal Study of 1988 (NELS88), which is the third in a series of national longitudinal studies developed and administered by the National Center for Educational Statistics (NCES) at the Department of Education. The aim of this ongoing program is to study the "educational, vocational, and personal development of students at critical stages in their educational careers, and the personal, familial, social, institutional, and cultural experiences that may affect development" (Curtin, et al. 2002). The NELS sample was a nationally representative two-stage stratified probability sample. In the first stage, 1,057 schools were selected with probabilities in proportion to their estimated enrollment. The sample was also stratified based on school type, region of the country, urbanicity, and percentage of minority enrollment (Curtin, et al. 2002). For the second stage of the sampling, 26 students were selected randomly from each school (Curtin, et al. 2002). Data were collected on many educational, psychological, school, and family background variables to examine many relevant educational issues. Students completed a questionnaire and a series of achievement tests.

The baseline survey in 1988 included about 27,800 eighth-grade students. The second follow-up survey was conducted in 1992 when the subjects were twelfth-graders. Of the 18,241 students interviewed in the twelfth grade, 5,608 who meet the sample selection criteria are used in this analysis. These selection criteria include all observations with non-missing values for variables measuring grades, twelfth-grade standardized-test scores, family income, socio-economic status, race, gender, type of school, urbanicity of

the school, along with the amounts of time spent doing homework, participating in extracurricular activities, and working for pay.

The NELS88 study is well suited for the purposes of this study for several reasons. Besides containing information on twelfth-grade achievement and work experience, NELS88 data contain information on innate academic ability in the form of twelfth-grade standardized test scores. Second, members of the NELS88 survey were twelfth-grade students in 1992, a full decade later than students in the data used by most other studies that examine the effects of student employment.

A significant weakness of NELS88 has to do with the variable that measures the number of hours per week worked by the student. Ideally, a continuous measure of hours worked per week would be available. Instead, the NELS88 data set contains a categorical variable giving hours worked per week on "the current or most recent" job held in the twelfth-grade. In this variable, hours worked per week are coded into 10 categories that represent five-hour increments ranging from one to five hours per week through "worked more than 40 hours per week." Students who did not work at all are also identified with this variable. The same categorical problem arises for the self-reported family income measure and for the variables measuring time spent on homework and extracurricular activities. To approximate a continuous variable, each student is assigned the midpoint value of the respective categorical range. This method was also used by Tyler (2003) in his paper on the effects of state child labor laws and school-year work on high school math and reading test scores.

To measure the family background of the students, a composite socio-economic status (SES) variable is used. This variable is constructed by the NCES using the

students' father's educational level, mother's educational level, father's occupation, mother's occupation, and family income. First, values are assigned to each parent's education level. Higher education levels have higher values. Next, the occupational data were recoded using the Duncan SEI scale as used in the HSB survey (NELS88). The values assigned vary by occupation type, and are higher for more professional occupations. Family income is assigned its own categorical value from the questionnaire. The composite is then created by taking the sum of the components and dividing by the number of valid or non-missing components. This variable is then normalized. The measure of socio-economic status has a mean of 1.04 and standard deviation of 7.64 with values ranging from -22.36 to 20.1. The higher the number value for this variable is, the higher the overall composite status. This gives a continuous variable to use to control for the students' family backgrounds.

The variables representing racial/ethnic background are gathered by the NELS88 questionnaire and are simple categories representing White, Black, Hispanic, American Indian, and Asian-Pacific Islander. The gender of the participants is also given.

Twelfth-grade standardized-test scores are used to control for innate academic ability. This is a composite of scores from reading and math tests (NELS88). The values of these test score range from 28.31 at the low end to 71.04 at the upper bound. Grade-point average is measured as a continuous variable based on the standard four point scale where 4.0 is the highest possible grade of "A" and 0.0 is the lowest possible grade of "F." Grade point average has a mean of 3.10 while the average score on standardized tests is 53.48.

Table 1 - Sample Means by Hours of Work per Week

	Entire Sample	Sample by Twelfth-Grade Hours of Work per Week			
		Zero	1-10	11-20	Over 20
Percent of sample	...	21.61 (41.16)	21.26 (40.92)	34.02 (47.38)	23.11 (42.16)
Gender:					
Female	53.0 (49.91)	49.34 (50.02)	56.71 (49.57)	56.81 (49.54)	47.38 (49.95)
Male	47.0 (49.91)	50.66 (50.02)	43.29 (49.57)	43.18 (49.54)	52.62 (49.95)
Race:					
White	76.7 (42.24)	72.03 (44.90)	80.45 (39.67)	77.20 (41.96)	77.16 (42.0)
Black	6.9 (25.35)	9.57 (29.43)	4.78 (21.35)	6.34 (24.38)	7.18 (25.82)
Other race[a]	16.3 (36.97)	18.40 (38.76)	14.77 (35.49)	16.46 (37.09)	15.66 (36.36)
Family income:					
Below $25,000[b]	26.2 (43.97)	25.00 (43.32)	21.56 (41.14)	25.26 (43.46)	32.95 (47.02)
Between $25,000 and $75,000[b]	58.11 (49.34)	50.33 (50.02)	57.97 (49.38)	62.79 (48.35)	58.64 (49.27)
Above $75,000[b]	15.69 (36.37)	24.67 (43.13)	20.47 (40.37)	11.95 (3245)	8.41 (27.77)
Type of school:					
Urban	25.91 (43.82)	29.54 (45.64)	25.34 (43.51)	24.53 (43.04)	25.08 (43.36)
Suburban	39.96 (48.99)	37.62 (48.46)	40.27 (49.06)	42.09 (49.38)	38.73 (48.73)
Rural	34.13 (474.2)	32.84 (46.98)	34.40 (47.52)	33.39 (47.17)	36.19 (48.07)
Public	84.68 (36.02)	76.73 (42.27)	80.62 (39.54)	88.68 (31.69)	89.97 (30.05)
Catholic	8.27 (27.55)	8.33 (27.65)	9.65 (29.54)	8.33 (27.65)	6.87 (25.30)
Other private[c]	7.04 (25.59)	14.93 (35.66)	9.73 (29.65)	2.99 (17.03)	3.16 (17.51)
Hours per week on:					
Homework	6.73 (5.75)	8.0 (6.33)	7.14 (5.72)	6.40 (5.44)	5.64 (5.37)
Extracurricular Activities	5.46 (6.50)	6.89 (6.86)	6.54 (6.71)	5.00 (6.28)	3.79 (5.80)
Standardized test scores	53.48 (9.15)	55.17 (9.54)	55.14 (9.06)	53.43 (8.73)	50.44 (8.66)
Socio-economic status	1.044 (7.637)	2.579 (8.500)	2.813 (7.610)	0.438 (6.934)	-1.128 (6.999)
Grade point average	3.10 (.6824)	3.20 (.6829)	3.21 (.6396)	3.09 (.6623)	2.92 (.7104)

a - Includes Hispanic, American Indian, & Asian-Pacific Islander
b – In 1992 dollars
c - Includes all Non-Catholic Private Schools
Standard deviations in parentheses
N = 5608

Table 1 reports summary statistics for the sample. The first column displays means and standard deviations for the entire sample. Just over half of the entire sample is female and three quarters are white. Over 25 percent of the sample have self-reported family income of less than $25,000 per year, while only 16 percent report family income of over $75,000. Eighty-five percent of the sample attended a public school in twelfth-grade, and nearly two-thirds of the sample is located in or near a metropolitan statistical area.

The next four columns of the table divide the sample into relatively broad hours-per-week work categories. These columns indicate that there are apparent differences between students who work different numbers of hours during the school year. There are several ethnic/racial differences in the labor supply that are notable. First, white students are most concentrated in the 1–10 hours per week category, the range where it may be the easiest to combine work and schooling. Meanwhile, a relatively high percentage of minority students are found in the zero hours category, indicating that minority students are either choosing not to work or are less successful in finding work during the school year. Previous research has shown that minorities, especially teenagers, have higher unemployment rates (Gardecki, 2001). Almost one-third of those students who work more than 20 hours per week come from families with incomes below $25,000. At the same time, those from families with total incomes over $75,000 are more likely to work less than ten hours per week during the school year.

There are only small differences in average GPA between those who worked zero hours per week in the twelfth grade and those who worked up to 10 hours per week. Meanwhile, average GPA is lower for those who work between 11 and 20 hours per week

and lower still for those who work over 20 hours per week. The initial evidence is that working more hours is negatively related to academic achievement.

Table 2 reports the proportion of students in each broad work category by individual characteristics. It is apparent from the table that there are differences in the number of hours worked among similar students. For example, over a third of females work between 11 and 20 hours per week compared with 20 percent who do not work at all, while males are least likely to work 1-10 hours per week. White students are also

Table 2 - Hours of Work per Week by Individual Characteristics

	Twelfth-Grade Hours of Work per Week			
	Zero	1-10	11-20	Over 20
Percent of full sample	21.61	21.26	34.02	23.11
Gender:				
Female	20.12	22.75	36.44	20.66
Male	23.29	19.58	31.26	25.87
Race:				
White	20.28	22.28	34.21	23.23
Black	29.97	14.73	31.27	24.03
Other race[a]	24.34	19.22	34.28	22.16
Family income:				
Below $25,000[b]	20.63	17.5	32.81	29.08
Between $25,000 and $75,000	18.72	21.20	36.76	23.32
Above $75,000[b]	33.98	27.72	25.91	12.39
Type of school:				
Urban	24.64	20.78	32.21	22.37
Suburban	20.35	21.42	35.83	22.40
Rural	20.79	21.43	33.28	24.50
Public	19.58	20.24	35.63	24.55
Catholic	21.77	24.78	34.27	19.18
Other private[c]	45.82	29.37	14.43	10.38

a - Includes Hispanic, American Indian, & Asian-Pacific Islander
b – In 1992 dollars
c - Includes all Non-Catholic Private Schools
N = 5608

most likely to work 11-20 hours per week. The majority of students coming from lower-income families work more than ten hours per week, indicating that their added income might be needed by their families. The opposite is true of students whose families have incomes over $75,000; sixty-two percent work less than ten hours per week or none at all. Likewise, almost half of all students in non-Catholic private schools do not work at all. Because these schools require tuition payments, students attending these private schools most likely come from families that can afford for their children not to work. In addition, some of these schools may have more stringent academic standards, forcing students to focus on schoolwork to remain enrolled.

Theoretical Framework and Empirical Model

Along with the zero-sum model, Becker's household production (1981) model provides the basic framework for the model used in this study. To begin with, students are assumed to maximize utility with a utility function of:

$$U = U(G, Z),$$

where G is the GPA earned by the student and Z is an aggregate consumption good. Since grades cannot be purchased in the marketplace, G must be produced by the student using time and other purchased inputs. The student's production function is given as:

$$G = g(x, t_{sw}, t_L, t_{emp}, E),$$

where x represents purchased inputs such as tuition or books, t_{sw} represents time spent on schoolwork, t_L represents time spent on leisure activities, t_{emp} represents time spent on paid employment, and E is a vector of environmental variables including ability, human capital, and social and physical climate (Becker, 1981). The student then chooses x, t_{sw}, t_L, t_{emp}, and Z to maximize his or her utility subject to income and time constraints.

By using ordinary least squares (OLS) regression, a linear relationship between the independent variables (regressors) and the endogenous (dependent) variable can be shown. The basic empirical model used in this paper is then: GPA = *f*(hours per week spent on homework, hours per week spent on extracurricular activities, hours worked per week, standardized-test scores, type of school, urbanicity of the school, gender, race, socio-economic status). The equation used to estimate the regression line is:

$$GPA_i = \beta_0 + \beta_1 Homework_i - \beta_2 Extracurricular\ Activities_i - \beta_3 Work_i + \beta_4 Test\ Scores_i + \beta_5 SES_i + \beta_6 Female_i - \beta_7 Non\text{-}White_i \pm \beta_8 Non\text{-}Public_i \pm \beta_9 Non\text{-}Urban_i \pm \beta_{10} Urban*Non\text{-}White_i + \varepsilon_i$$

where for each student *i*:

GPA_i is the student's grade point average,

$Homework_i$ is hours per week spent on homework,

$Extracurricular\ Activities_i$ is hours per week spent on extracurricular activities,

$Work_i$ is hours per week spent working at a job,

$Test\ Scores_i$ is a composite of the student's twelfth-grade standardized test scores,

SES_i is a composite of the student's socio-economic status,

$Female_i$ is a dummy variable for gender taking the value of 1 if female, 0 otherwise,

$Non\text{-}White_i$ takes the value of 1 if the student is Black, Hispanic, American Indian, or Asian, 0 otherwise,

$Non\text{-}Public_i$ is a dummy variable taking the value of 1 if the school is any type of private school, 0 otherwise,

$Non\text{-}Urban_i$ is another dummy variable taking the value of 1 if the school is not located in an urban area, 0 otherwise,

$Urban*Non\text{-}White_i$ is an interaction term to determine the effects on minority students from urban schools, and

ε_i is an error term capturing unobserved determinants of GPA.

The coefficient of each variable should reflect the impact that variable has on the dependent variable, GPA. The amount of time spent on homework should have a positive relationship with GPA. Time spent participating in extracurricular activities should have

a negative impact on grades, as this takes time away from homework and studying. The independent variable of concern is the number of hours worked per week. This should also have a negative relationship with GPA. These assumptions follow the zero-sum model where, as hours spent on any one activity increase there is less time to devote to other activities.

However, there are competing hypotheses at work here. It is possible that there is some self-selection occurring. For example, a very bright student may spend less time finishing the same amount of homework as a less able student. In this case, homework would have a negative effect on GPA. Also, the students who need less time outside of class to fully understand the material may spend more time on after-school activities. Students who are better time managers may be more likely to participate in extracurricular activities. They may also participate in activities that relate more to scholastic achievement or aptitude such as Mathletes or Scholastic Bowl, which like many activities may require a student to keep a minimum GPA to remain eligible.

Several studies use standardized test scores as the measure of academic achievement (Lillydahl, 1990; Singh, 1998; Tyler, 2003). In this study, test scores are used to control for innate ability. This is similar to the approach used by Tyler (2000). He uses tenth-grade test scores to control for "observed ability," while twelfth-grade scores are used for the dependent variable. In the case of this study, twelfth-grade standardized test scores measure observed ability and they will positively affect GPA, since a higher score likely translates to a greater ability to receive good marks.

Previous research has consistently shown that socio-economic status influences academic outcomes (Singh, 1998). Students who belong to a higher socio-economic

status are more likely to have higher achievement. Therefore, the coefficient for socio-economic status should also be positive. The value of this composite captures the education, occupation, and income of the student's parents. The probability that a student earns higher grades is likely to be greater for those whose parents have higher levels of education and income. A key aspect of this measure is the parent's education levels, because a parent with a higher level of education likely values their child's education more and encourages success. Genetics may play a role here as well. It is not uncommon for athletic parents to have athletic children; the same might be said for intelligence.

Gender is included in the model because gender-based differences are often reported in test scores and grades (Singh, 1998; Greenberger & Steinberg, 1986). It is hypothesized that being female will have a positive effect on grades. Racial and ethnic differences are also reported throughout the literature (Gardecki, 2001; Mohanty, 2002), which gives reason to include this variable in the model. The coefficient for this variable should be negative because minorities have been shown to have lower grades than white students. Racial differences at inner-city schools are also examined by the inclusion of an interaction term between *Urban* and *Non-White*.

To control for grade inflation, that is, that an "A" at one school may not be the same as an "A" from another school, the type of school and the urbanicity of the school are included. These variables are included as a proxy to control for quality across schools. This is an imperfect measure of school quality, but better measures such as average SAT or ACT scores are not available. In addition, grade inflation may be better examined if we had information on a student's class rank, but this information is not contained in the

NELS88 data either. No *a priori* assumptions can be made about the sign of the coefficients for type of school or urbanicity of the school.

Before proceeding further, there are four least squares assumptions that must be made for this multiple linear regression to be considered valid. The first is that the conditional distribution of u_i given $X_{1i}, X_{2i}, \ldots, X_{ki}$ has a mean of zero. This means that for any value of the regressors, the expected value of ε_i is zero. The second assumption is that $(X_{1i}, \ldots, X_{ki}, Y_i)$ $i=1,\ldots,n$ are independently and identically distributed (i.i.d.) random variables. This assumption holds automatically since the data were collected by simple random sampling. The third least squares assumption is that $X_{1i}, \ldots, X_{ki}$ and ε_i have four moments that are nonzero and finite. The fourth assumption is that there is no perfect multicollinearity. This simply means that none of the regressors is a perfect linear function of the other regressors.

The OLS estimation results reported in Table 3 show that most of the coefficients are statistically significant. As expected the coefficient for *Homework* is positive and significant at the one percent level. However, the effect on GPA is rather small. A one hour increase in the amount of time spent on homework is associated with only a 0.005 point increase in GPA. Surprisingly, extracurricular activities have a statistically significant, positive effect on GPA. Each additional hour spent on extracurricular activities actually increases GPA by almost 0.01 grade points. This is most likely caused by the students who are better time managers self-selecting into participation in these programs. Also, extracurricular activities often require keeping grades above some minimum level for the student to remain eligible to participate.

Table 3 - Regression Results

Independent Variable - GPA	Coefficient[a]
Homework	.0050532* (.0013997)
Extracurricular Activities	.0097552* (.0012172)
Work	-.0016331** (.0007326)
Test Scores	.0367916* (.0009577)
Socio-economic Status	.0045942* (.001155)
Female	.1416777* (.0152622)
Non-White	.1145392* (.022591)
Non-Public	-.070534* (.0242612)
Non-Urban	-.0167071 (.0230831)
Urban*Non-White	-.1183537* (.0385677)
Constant	.9977553* (.0572888)
$R^2 = 0.3209$	Adjusted $R^2 = 0.3197$
N = 5608 * $\alpha < 0.01$ ** $\alpha < 0.05$ a - Standard errors in parentheses	

As hypothesized, the coefficient for *Work* is negative and significant, although it has a very small effect. GPA falls by about 0.002 points for each additional hour worked. Table 4 reports expected GPA for different hours of work holding all the other independent variables constant at their means. For each 10 hour increase in work, the estimated GPA falls by only about 0.02 points. This is a relatively small effect. Expected GPA is only 0.07 grade points lower for students who work 40 hours per week than it is for those who do not work at all.

Table 4 - Estimated GPA by Hours of Work

Hours of Work	Estimated GPA
0	3.14
10	3.12
20	3.10
30	3.09
40	3.07

Table 3 indicates that the coefficient for twelfth-grade test scores and socio-economic status are both positive and significant at the one percent level. Test scores have a moderately strong effect on grade point average. A one point increase in test score translates to an increase in GPA of 0.04.

It seems that the education level and occupation of a student's parents is important. As previously discussed, the variable for socio-economic status includes these, along with family income. The results from Table 3 indicate that as the socio-economic status composite score increases by one point, GPA increases by almost 0.005 points. This coefficient is significant at the one percent level. However, if income is also included in the regression, the coefficients for both socio-economic status and income are not significant from zero.

To more closely examine the effects of socio-economic status on a student's GPA, I also estimated a regression including household income in place of the SES variable. Household income was not found to significantly affect a student's GPA. This leads to the conclusion that students whose parents hold advanced degrees and hold

professional jobs, such as doctors or college professors, earn slightly higher grades than other students.

Similar to the findings of previous studies, there are significant gender- and racial-based differences in grades. Being female is associated with a GPA that is 0.14 points higher than that of a male. Non-white students have grade point averages 0.11 points higher relative to white students. However, being a minority student in an urban school is associated with a GPA that is 0.12 points lower than students in suburban and rural schools and white students in urban schools. Teenagers who attend private schools have slightly lower grades, 0.07 points lower, than students from public schools. The coefficient for attending a school outside of an urban area is not statistically different from zero.

The coefficient of determination, or R^2, is the ratio of the explained sum of squares to the total sum of squares, or the percentage of change in the dependent variable due to the independent variables in the regression. By correcting for degrees of freedom, which will result in some small reduction in the error sum of squares, we get the *adjusted* R^2, which is a better measure. With an R^2 of 0.3209 and *adjusted* R^2 of 0.3197, this model appears to do an acceptable job of explaining variation in *GPA* across students. This can be interpreted as the regression explaining about 32 percent of the variation in *GPA*.

While R^2 and *adjusted* R^2 measure the overall degree of fit of the estimation, they do not provide a formal hypothesis test of that overall fit. Such a test is provided by the *F*-test. The *F*-test is used to test the overall performance of the regression. The null hypothesis of the *F*-test is that all the slope coefficients, βs, are equal to zero simultaneously. To show that the overall fit of the regression is statistically significant,

the null hypothesis must be rejected using the F-test. By taking the ratio of the explained sum of squares to the error sum of squares, adjusted for the number of independent variables and the number of observations in the sample, the F-statistic is computed to be 264.48. A general rule of thumb is that any F over 2 will be significant. This F-statistic is much greater than 2 and is significant at the one percent level.

Heteroskedasticity occurs when the error terms are not distributed normally around the regression line. When this takes place the coefficients are still linear, unbiased, and consistent, but their standard errors are underestimated and the t tests are unreliable. Heteroskedasticity can be discovered by computing the White general test for heteroskedasticity in the error distribution by regressing the squared residuals on all distinct regressors, cross-products, and squares of regressors. After using the White test for heteroskedasticity, it is safe to conclude that the error terms are normally distributed around the regression line; there is no heteroskedasticity.

Conclusions and Future Research

Previous research on the effect of employment during high school has produced inconsistent results. The purpose of this study was to investigate the influence of work hours on academic achievement, measured by grade point average. GPA was chosen because it is a more direct measure of performance in high school than standardized-tests. It captures the day-to-day performance of students on everything from homework to quizzes and in-class participation to final examinations.

The number of hours worked per week seems to have a small negative impact on grades. This decrease in academic achievement caused by work may result from the displacement of extracurricular and co-curricular activities by work and work-related commitments. When high school students work long hours, it is possible that they devote less time to homework, extra reading, and other academic activities. Part-time work may also mean less involvement in after-school activities. These results provide support to the zero-sum view that time is limited.

Perhaps work has little influence on GPA because everyone is getting good grades. It is possible that this model does not control for school quality properly. The average GPA, at 3.10, is a solid grade of "B." The main drawback of using grade point average as the dependent variable is that grade inflation makes comparing GPAs across schools difficult. If the students' class ranks were available, then it would be possible to somewhat control for the quality of schools by examining GPAs relative to rank.

Future research in this area is still needed because there is little agreement as to the proper measure of academic achievement. The results of this study parallel those of much of the past research dealing with academic outcome. Because these results are

similar to those from studies that use standardized test scores as the dependent variable, it is difficult to settle on the proper dependent variable. In keeping with the argument earlier though, the test scores look as if they capture the unobservable ability of the students. An ideal study might do a better job controlling for school quality. It may also include a variation of the 2SLS estimation used by some researchers, which might be more appropriate to capture reasons for working and lead to stronger conclusions. This method could also examine the effect of high school employment on the amount of human capital gained by students. Do they receive general training, specific training, or no beneficial training at these jobs? Also, the type of job may be an important piece of the puzzle. It is quite likely that various jobs have different responsibilities and duties and thus affect academic performance in a variety of ways.

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